## GEOMETRY.

341. Proposed by FRANK LOXLEY GRIFFIN, S. M., Ph. D., Instructor in Mathematics, Williams College.

Given $\rho=\cos(m/n)\theta$, where $m$ and $n$ are integers without a common factor. Deduce rules for finding by inspection:

(1) The angle between the beginning and end of any loop of this curve; (2) The number of distinct loops. [A loop is a portion of the curve between consecutive zero radii vectores.]

## CALCULUS.

267. Proposed by FRANK LOXLEY GRIFFIN, S. M., Ph. D., Instructor in Mathematics, Williams College.

A point within an ellipse, upon a normal making an angle $\lambda$ with the major axis, is arbitrarily chosen. With this point as pole, and the line through it parallel to the major axis as polar axis, the equation of the ellipse is, $A\cos^4\theta+B\cos^3\theta+C\cos^2\theta+D\cos\theta+E=0$, where the coefficients are functions of $\lambda$, of the radius vector $\rho$, and of the distance along the normal to the pole, $\rho_1$. Evidently for $\rho=\rho_1$, a solution is $\cos\theta=\cos\lambda$. Required the multiplicity of this solution for any values of $\rho_1$, $[\lambda\neq 0,\ \rho_1\neq 0]$.

268. Proopsed by PROFESSOR R. D. CARMICHAEL, Anniston, Ala.

Determine $\phi(y)$, independent of $u$, so that the equation $\int_0^u (u-y)^{(2p-1)/2}\phi(y)dy=u^m$ is satisfied, $p$ and $m$ being positive integers and $m>p$. Do you notice properties of special interest for any special cases?

## MECHANICS.

223. Proposed by G. B. M. ZERR, A. M., Ph. D., Philadelphia, Pa.

A sphere, radius $r=\frac{1}{3}$ inches, density $\delta=11.38$, falls from a height $h=500$ feet, into a lake depth $l=40$ feet. Find time of falling to surface of lake, time of falling from surface of lake to bottom, and total time of falling. Also the velocity at the bottom.

224. Proposed by G. B. M. ZERR, A. M., Ph. D., Philadelphia, Pa.

A steel clock spring $w=\frac{7}{8}$ inch wide, $t=\frac{1}{32}$ inch thick, is wound around an axle $d=\frac{1}{4}$ inch in diameter. Find the greatest available moment for running the clock, using a factor of safety $f=6$.

## NUMBER THEORY AND DIOPHANTINE ANALYSIS.

159. Proposed by E. B. ESCOTT, Ann Arbor, Mich.

Show that if the equation $y^3=2x^2-1$ be possible in integers, $y=24n^2-1$, or $2n^2-1$, and find three solutions.